

Tuberculosis and Rehabilitation

Dynamic Physical Restoration of Patients With Active Disease

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IN MEDICINE the word *rehabilitation* implies recovery of a patient from a physical illness and his return to a condition permitting resumption of his former status of employment or occupation. However, before the era of chemotherapy, because of the serious complications in active tuberculosis, physicians were forced to modify this concept and, with few exceptions, guided the patient into less strenuous work with limited hours and under sheltered conditions. The majority of patients were forced into jobs which were economically inferior or emotionally unsatisfactory. Much impressed by the dramatic changes in the treatment of active tuberculosis brought about by chemotherapy with antibiotics, the authors in 1956⁴ embarked on a formalized system of dynamic active exercises during the last two months of hospitalization, combined with chemotherapy and antibiotics, the goal being return of the patient to his former job immediately on discharge from the hospital. One hundred and fifty-five patients were treated in this program during the period 1956-1960. In the succeeding three years 299 additional patients with active tuberculosis were placed on a program of dynamic active exercises simultaneously with chemotherapy and antibiotics, and the results achieved form the basis of this report.

The criteria for admission to this program (1956-1960) were stability of lesions as observed roentgenographically, absence of cavitation (using laminography in the anteroposterior and lateral views) and sputum consistently negative for tubercle bacilli on microscopic examination. A patient who met these criteria was advanced to full ambulation status. He was required to make his own bed, police his bedside area and go to the main dining room for his meals. He was unrestricted as to his activities. If he was receiving streptomycin he was taught to inject it himself under supervision of a nurse. Bottles of para-aminosalicylic acid (PAS), isoniazid

• In a study carried out over a period of seven years, 454 patients with active tuberculosis were placed on a program of intensive physical exercise, combined with chemotherapy and antibiotics.

In the initial group of 155 patients studied from 1956-1960, the intensive rehabilitation program was not instituted until the last two months of the patient's stay in hospital, whereas in a late phase of the study 1960-1963 the dynamic physical restoration program was instituted early for 299 patients and was carried on simultaneously with chemotherapy and antibiotics.

The beneficial results of these programs appear to show that the concept of minimum exercise and prolonged bed rest in the hospital and a prolonged convalescent period after discharge, is no longer justified.

and pyridoxine were supplied, which he kept at his bedside. The patient was responsible for taking the drugs as prescribed. He was given a program of physical, occupational and pre-vocational therapy to follow.

Follow-up studies were obtained on the post-hospital experience of 118 of the original group of 155 patients. Eighty-eight of the 118 had returned to full activity work upon discharge from the hospital, 22 were unemployed, 10 had been retired before they entered the hospital for treatment of tuberculosis, and 12 were unable to work because of other limitations or a combination of disabilities—for example, psychiatric disorders and emphysema. Four of the patients died, one of cirrhosis of the liver (autopsy showed no evidence of active tuberculosis), one of heart disease, and two of unstated cause but both were emphysematous and chronic alcoholics. In none of these cases was tuberculosis given as the primary or as a contributing cause of death. Four of the group of 88 were put in hospital again for active tuberculosis, and did not return to work.

The need for rest in the treatment of active pulmonary tuberculosis was universally accepted until some years ago, when a questioning attitude developed concerning the role that rest played in the recovery of tuberculosis patients under adequate drug therapy. Hirsch³ and co-workers, in a well

Presented before the Section on Physical Medicine at the 92nd annual session, California Medical Association, Los Angeles, March 24-27, 1963.

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controlled study, demonstrated that recovery from pulmonary tuberculosis can be achieved without bed rest in persons with a drug-susceptible organism. They suggested that rest for the asymptomatic patient had little if any effect on the rate or degree of recovery and that more harm than good might result from prolonged inactivity. The Tuberculosis Chemotherapy Center in Madras, India,⁵ reported a one-year study of 163 patients taken at random between home and sanatorium care while under chemotherapy for active tuberculosis. Although it was difficult to evaluate activity at home as against activity in the sanatorium, the patients in the home series were physically much more active than those in the sanatorium. The proportion of the males on home care who had returned to part-time or full-time activity was 13 per cent by three months, 35 per cent at six months, 57 per cent at nine months and 80 per cent at 12 months. In contrast, only a small proportion of sanatorium patients were permitted to be out of bed for as much as four hours a day by three months (8 per cent) and only 19 per cent at 12 months. At the end of one year, 10 per cent of the females in the sanatorium were allowed up for four hours a day, whereas 91 per cent of the females on home care had returned to part-time or full-time activity. Despite this difference in activity, the results of treatment as judged by sputum "conversion," cavity closure, roentgenographic stability and clinical findings were not statistically different in the two groups.

Our original treatment and study (1956-1960) differed from the one conducted by Hirsch and that of the Madras group, in that our major interest was in increasing the muscle tone so that the patient could be returned to his former occupation regardless of the strenuousness of such work, and in seeing if the relapse rate in these patients would be greater.

Our later study (1960-1963) of dynamic physical restoration was conducted with a view of evaluating the effect of activity during the early treatment of tuberculosis in hospitalized patients, from the standpoint of employment, medical disabilities precluding employment, maximum self-efficiency for independent living, relapse, and fatality.

PLAN OF STUDY

The criterion for admission to our present program of dynamic physical restoration is a diagnosis of active tuberculosis. The patient is started on a chemotherapy regimen and, when afebrile (usually within two weeks), on referral by the physician to the physiatrist, a dynamic physical restoration program that is carried out simultaneously with treatment, is begun. An evaluation of the patient's complete history and physical examination is made by

the physiatrist, in the Department of Physical Medicine, to determine the patient's individual physical status. He is then referred, by prescription, to the physical therapy and the occupational therapy sections, and later to the corrective therapy section. Any necessary precautions or physical limitations are noted on the prescription to the therapist.

CONTROLLED DYNAMIC EXERCISE PROGRAM

The physical therapy treatment is divided into a light exercise program and a heavy exercise program, with approximately 20 patients in each group, to allow for variation in light or heavy exercise programs for each group.

The following exercises are to be carried out in a standing position:

Light Exercise Program

1. Deep breathing, up to ten repetitions each.
 - (a) With hands on upper chest.
 - (b) With hands on sides of rib cage.
 - (c) With hands on front, lower rib cage.
2. Hands behind neck, up to ten repetitions, bring elbows together, then extend them back as far as possible (breathing in rhythm).
3. Deep knee bending, up to seven repetitions.
4. With knees straight, bring right hand toward left foot, alternate, up to seven repetitions.
5. Flex hip and knee, with foot make two complete circles, alternate, up to ten repetitions.
6. Place hands on wall and do push-ups against wall, up to 15 repetitions.
7. Using wand, elbows straight, with hands in supinated position and holding each end of wand, move arms straight out to side, bringing arm over head. Up to ten repetitions toward the left, up to ten repetitions toward the right.
8. Using wand, hands in supinated position, bring wand up and over the head, up to ten repetitions.

Heavy Exercise Program

Carry out items 1, 2, 3, 4 and 5 of light exercise program, up to ten repetitions for each.

Then, lying on a mat:

6. Holding weights in hands and with arms slightly off mat, roll up to sitting position, reaching forehead toward feet, then roll back to rest position.
7. With knees flexed and 3-pound weights in each hand, bring straight arms over head as far as possible, then bring back to midline over body, abduct arms to each side, back to midline, return to rest position.
8. Lying on left side, with left knee slightly flexed, lift straight right leg upward, then forward, then

back to full extension, then back to midline position, and down to rest position.

9. Lying prone, one to five push-ups, with rest periods after each push-up.

10. Lying prone, with 3-pound weights in hands and with arms in 45 degree angle away from sides of body, lift arms, legs and head off mat, down and return to rest position.

11. Lying on right side, same as item 8.

Occupational Therapy

Occupational therapy is prescribed for tonic and kinetic purposes to improve or maintain muscle tone and to relieve emotional stress. The ward program consists of craft activities. Those most commonly used are:

1. Making leather wallets, belts, purses, etc.
2. Metal tooling—copper and aluminum.
3. Woodburning—trays, plaques, boxes.
4. Weaving on table looms—wool scarves and table mats.
5. Rake knitting—rugs, stoles, ski caps.
6. Art—oils, watercolors, pastels, drawing.
7. Ceramics, hand modeling.
8. Fly-tying.
9. Stenciling.

Patients work at things chosen of their own individual interest, with pace and time depending on their physical status. They are seen daily by the occupational therapist, who instructs, encourages and assists them with their projects. They usually work in a sitting position at tables in their rooms, often working together, socializing.

The Occupational Clinic hours are from 10:00 a.m. to noon and from 3:00 to 4:15 p.m. The purpose of kinetic therapy is pre-vocational development of power and tolerance in sitting and standing positions.

Patients are issued the necessary projects to accomplish the objective for progress in activity and conditioning. Among the activities available for upper and lower extremity development are working with plastics and woodworking. These require the patient to stand at a work bench and walk about the clinic to get the tools for sawing, filing and finishing. For development of power and endurance of the lower extremities, patient stands at a jig saw to cut out needed shapes of wood and plastics.

Other activities include using a hand-operated printing press, with the patient in a standing position, to develop standing tolerance and the dexterity required in setting type. Floor looms are used for sitting position exercises to develop the use of both upper and lower extremities. Large table looms are

used in sitting position activities to develop the trunk and upper extremities.

The progress of patients is watched constantly, and when ready to go on to a heavier program of resistive conditioning exercises, they are referred to the Corrective Therapy Section.

Corrective Therapy

For corrective therapy, patients have a prescribed program of general reconditioning. They are instructed to limit their exercises to their own physical capacity and endurance. The weights they use in exercises may vary from 3 to 20 pounds.

Exercise Program:

1. Arms Chop—bilateral—3 to 15 pound weights.
 - (a) Elbows straight.
 - (b) Elbows flexed.
2. Arms Lift—bilateral—3 to 15 pound weights.
 - (a) Elbows straight.
 - (b) Elbows flexed.
3. Shoulder and Elbow—unilateral—3 to 15 pound weights.
 - (a) Flexion and abduction—straight arm patterns.
 - (b) Flexion adduction—straight arm patterns.
 - (c) Horizontal abduction and adduction—straight arm patterns.
 - (d) Hyperextension adduction—straight arm patterns.
4. Elbow—unilateral—3 to 15 pound weights.
 - (a) Shoulder flexion—elbows in flexion and extension.
 - (b) Shoulder extension—elbows in flexion and extension.
 - (c) Horizontal abduction and adduction—elbows in flexion and extension.
 - (d) Hyperextension—adduction—elbows in flexion and extension.
5. Knee—5 to 20 pound weights.
 - (a) Flex peroneal.
 - (b) Flex posterior tibial.
 - (c) Extension, anterior tibial.
 - (d) Extension-dorsiflex.
6. Resistive exercises on bicycle—5 to 20 revolutions, three repetitions, with rest periods before each repetition.
7. DeLorme boot resistive exercises.

The ages of the patients studied in this group were similar to those of the original group, ranging from 21 to 76 years.

The extent of the disease was minimal in 41 patients, moderately advanced in 145, advanced in 98. Pleural effusion was present in six patients, and relapses occurred in nine of this group.

RESULTS

Two hundred and ninety-nine consecutively admitted patients with active tuberculosis were studied in this group from January 1960 to January 1963. All, when afebrile, were placed on a dynamic physical restoration program simultaneously with administration of chemotherapy and antibiotics, with a goal of returning them to full-time activity immediately on discharge from the hospital. The goal was achieved. All were rehabilitated and medically cleared to return to full-time employment or activity on discharge from the hospital if they wished to do so.

Reports were obtained from 267 patients after they left the hospital. Of this group, 153 had returned to full-time activity or employment immediately on discharge from the hospital, 67 were not working because they chose not to, 36 had been retired from work before they entered the hospital for treatment, and two were disabled because of other medical complications. Nine had a relapse.

Of this group of 299 rehabilitated patients, 19 were engaged in professional work, 30 in clerical work, 33 were skilled workers, 44 were semi-skilled workers, three were service workers, and 125 were unskilled laborers. The occupation of the remaining 45 patients was not known.

DISCUSSION

This study shows the importance of instituting a dynamic physical restoration program simultaneously with chemotherapy for maximum benefits. The rehabilitation program should be started the day the patient enters the hospital. He should be informed of the extent of his disease, assured that the outlook for his recovery is favorable, and that, without complications, he should be able to return to his former occupation immediately on discharge from the hospital. This preparation has proved a vital factor, psychologically, in the acceptance of hospitalization and in entering enthusiastically into

the rehabilitation program. All too often, lack of confidence may be the only barrier to total rehabilitation of the employable patient. Patients with minimal or moderately advanced disease and a very large number of those with far advanced disease can be adequately treated and totally rehabilitated in a period of six to ten months. The number of relapses will be extremely small if cavities are no longer present, sputum is non-infectious and chemotherapy is continued. If, after two months, there is no roentgenographic or bacteriologic evidence of relapse, the patient should be discharged to immediate full employment, preferably to his former job.

With this favorable outlook for the patient's total rehabilitation and ability to return to his former job within a fairly definite time, the social service worker has been able in a great majority of cases to make such arrangements with employers.

The socio-economic and emotional impact on the patient—often the sole breadwinner in the family—is definitely lessened by his shortened stay in the hospital. The social service worker is of invaluable help in the procurement of financial assistance when this is needed by the patient's family.

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